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BUTTERFLIES OF THE ARCHBOLD BIOLOGICAL STATION, HIGHLANDS COUNTY, FLORIDA

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ABSTRACT. Seventy butterfly species (27 Hesperiidae, 16 Nymphalidae, 11 Pieridae, 8 Papilionidae, and 8 Lycaenidae) have been recorded from the Archbold Biological Station near the southern end of the Lake Wales Ridge in Highlands County, Florida. Peaks of abundance and diversity for adult butterflies at Archbold occur in March and August. At least 11% (70 species) of the plants at the station provide butterflies with nectar or larval hosts, many of which are documented for the first time. Crab spiders, the green lynx spider, a phymatid bug, and a robber fly were observed feeding on adult butterflies. Approximately 12% of the butterflies found in Highlands County are limited primarily to peninsular Florida.

Additional key words: food plants, distribution, phenology, predators, Lake Wales Ridge.

The Archbold Biological Station (ABS) serves not only as a major center of biological research in Florida, but also as a preserve of the natural communities of the southern Lake Wales Ridge (Minno & Myers 1986). The Lake Wales Ridge is one of several ancient dune formations that run parallel to the peninsular coastline (Fig. 1). The deep, sandy soils of this region have given rise to distinctive xerophytic plant communities that contain many unusual organisms. Ward (1979) lists 18 endangered, threatened, and rare species of plants from the Lake Wales Ridge area. Neill (1957) discusses over 50 animal taxa found mostly in central peninsular Florida.

Fire plays an important role in shaping and maintaining the natural communities at ABS. Prescribed burning of small tracts of the station is conducted annually. Lightning-induced wildfires also occur regularly, especially during the summer. Central Florida experiences a hot, humid rainy season with frequent thunderstorms from June through September. Winters are mild and dry with occasional temperatures below freezing (Chen & Gerber 1990).

Some 540 species of vascular plants grow naturally at the station (Vander Kloet 1986), and about 80 species of exotic plants have been planted on the property (Herndon 1986). Abrahamson et al. (1984b) describe the plant associations of the station in detail. Generally, the western half of ABS is a mixture of flatwoods, scrub, and seasonal ponds. A few small bayheads (stands of broad-leaved evergreen trees), dominated by Loblolly Bay, *Gordonia lasianthus* (L.) Ellis (Theaceae), occur along the western and northern boundaries. Sand Pine scrub predominates in the northeastern portion of the station in the area around Red Hill. Sandhill vegetation covers the top of Red Hill and much of the

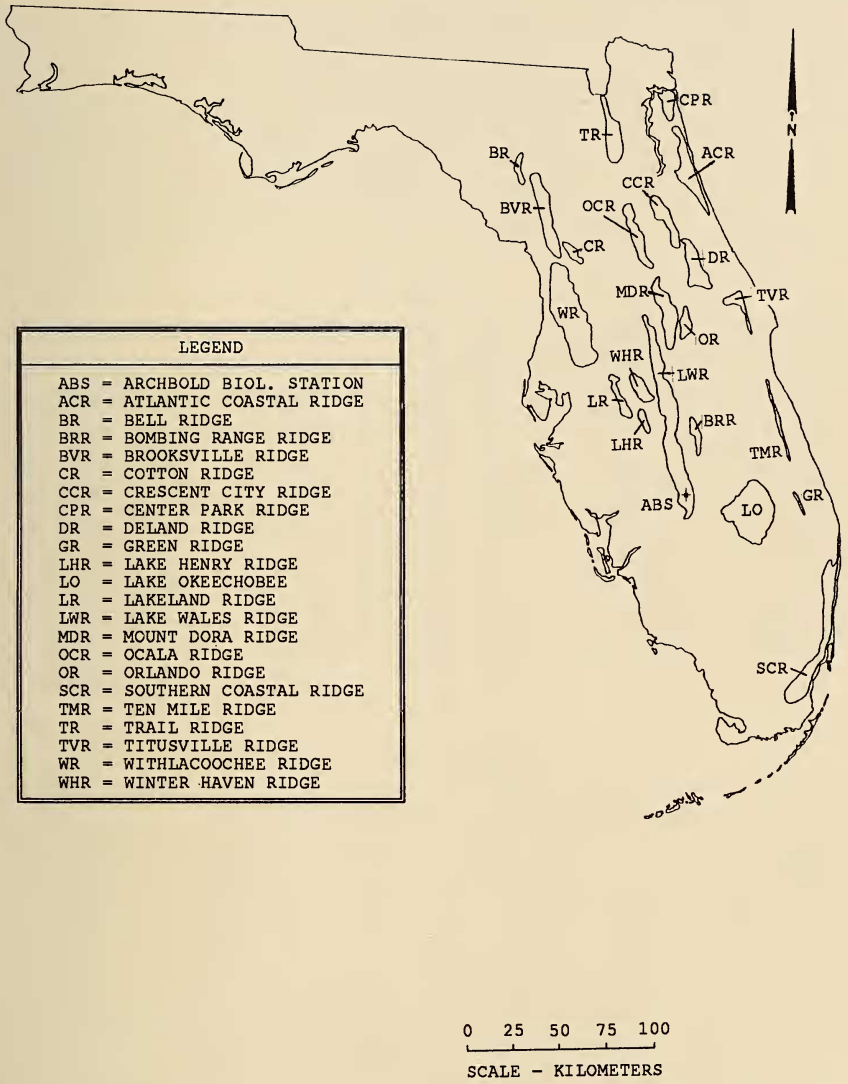

FIG. 1. Map of Florida showing the locations of the major sand ridges (after White 1970) and the Archbold Biological Station.

land from the main compound south to the abandoned settlement of Hicoria. A detailed vegetation map by Abrahamson, Johnson, and Layne (1984a) is available from ABS. Figure 2 shows a map of the main features of the station.

Little has been published on the butterflies of the Lake Wales Ridge.

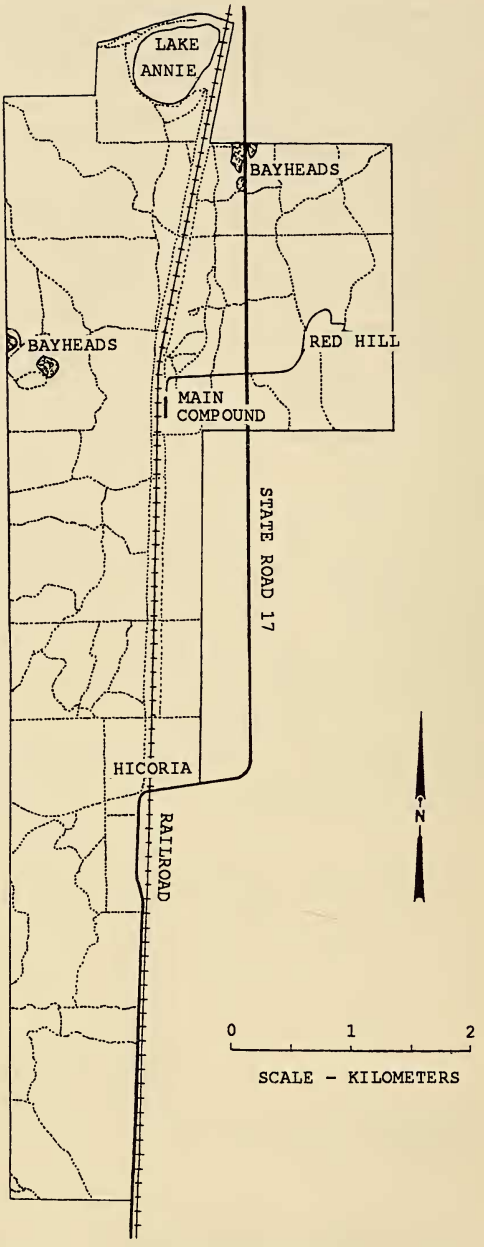

FIG. 2. Map of the Archbold Biological Station. Dotted lines indicate trails.

Comstock and Comstock (1902) listed 20 species from two sites on the ridge, Avon Park and Lake Josephine, in Highlands County. Frost (1964, 1966, 1969, 1975) collected ten species of hesperiids, five lycaenids, and two nymphalids in ultraviolet light traps at ABS. Other sources of data are mentioned in the species accounts below. In another report (Minno 1988), I presented a check list of the Lepidoptera of ABS. Here, I list the butterflies recorded from ABS and discuss their relative abundance, phenology, larval and adult resources, and predators.

METHODS

I collected and observed butterflies at ABS during November 1983; June–August, September, October, and November 1986; February and March 1987; and April 1988. During 1986 I visited nearly all parts of the station accessible by trail or road, but concentrated my efforts around the main buildings, Red Hill, Hicoria, and in the shallow ponds dominated by Redroot *Lachnanthes caroliniana* (Lam.) Dandy (Haemodoraceae) near the western bayheads, because these areas usually had an abundance of flowers that attracted butterflies. At each site, the date, beginning and ending sampling time, weather, species and number of individuals of each species observed, flowers visited, host plants, and predators, were recorded. Voucher specimens were deposited in the ABS reference collection.

ANNOTATED LIST OF SPECIES

The butterflies of ABS are discussed individually in the following list. Where known, the status, habitat, abundance, flight period, host plants (larval food plants), nectar sources, and predators are presented. The families and subfamilies are arranged in taxonomic order according to Hodges et al. (1983). Species are listed in alphabetical order. I categorize the butterfly species as abundant if they are likely to be encountered on a field trip to ABS, occasional if they are irregularly present in low numbers, and uncommon if less than five individuals are recorded from the station. Reference to eggs, larvae, or pupae indicates that more than one immature individual was found, but exact numbers were not recorded. The plant taxonomy and nomenclature used in the paper conforms primarily to that of Wunderlin (1982).

HESPERIIDAE: PYRGINAE

Epargyreus clarus clarus (Cramer)

STATUS: Occasional in the old citrus grove on Red Hill.
HOST PLANTS: One larva was found on *Galactia regularis* (L.) BSP. (Fabaceae).
FLOWERS VISITED: *Lantana camara* L. (Verbenaceae).

Erynnis brizo somnus (Lintner)

STATUS: Abundant in Sand Pine scrub, sandhill, and scrubby flatwoods habitats during the spring. Frost (1975) took one in an ultraviolet light trap.

HOST PLANTS: Larvae were found on *Quercus inopina* Ashe and *Quercus myrtifolia* Willd. (Fagaceae).

FLOWERS VISITED: *Conradina canescens* (Torr. & Gray) A. Gray (Lamiaceae).

Erynnis horatius (Scudder & Burgess)

STATUS: Abundant in Sand Pine scrub, sandhill, and scrubby flatwoods habitats. Frost (1966) took one in an ultraviolet light trap.

HOST PLANTS: Larvae were found on *Quercus inopina*, *Quercus myrtifolia*, and *Quercus hemisphaerica* Bartr. (Fagaceae).

FLOWERS VISITED: *Asclepias curtissii* A. Gray (Asclepiadaceae), *Bidens alba* (L.) DC. (Asteraceae), *Balduina angustifolia* (Pursh) Robins. (Asteraceae), *Dalea feayi* (Chapm.) Barneby (Fabaceae), *Diodia teres* Walt. (Rubiaceae), *Heterotheca subaxillaris* (Lam.) Britt. and Rusby (Asteraceae), *Lachnanthes carolinianum*, *Lantana camara*, *Palafoxia feayi* A. Gray (Asteraceae), *Vernonia gigantea* (Walt.) Trel. ex Branner and Coville (Asteraceae), *Wedelia trilobata* (L.) Hitchc. (Asteraceae). Males were occasionally found at mud puddles.

PREDATOR: An unidentified crab spider (Thomisidae) was found feeding on an adult on *Lachnanthes*.

Erynnis juvenalis juvenalis (Fabricius)

STATUS: Abundant in Sand Pine scrub, sandhill, and scrubby flatwoods habitats during the spring. One adult was taken in July (Burns 1964). Frost (1975) collected one in an ultraviolet light trap.

HOST PLANTS: A larva was found on *Quercus inopina* at Highlands Hammock State Park.

Erynnis zarucco zarucco (Lucas)

STATUS: Abundant in Sand Pine scrub, sandhill, scrubby flatwoods and disturbed sites. Frost (1969) took a few in an ultraviolet light trap.

HOST PLANTS: Larvae were found on *Galactia elliottii* Nutt. (Fabaceae), *Galactia regularis*, and *Indigofera caroliniana* Mill. (Fabaceae).

FLOWERS VISITED: *Asclepias curtissii*, *Bidens alba*, *Dalea feayi*, *Heterotheca subaxillaris*, *Lachnanthes caroliniana*, *Lantana camara*, *Liatris tenuifolia* Nutt. (Asteraceae).

PREDATOR: A green lynx spider (*Peucetia viridans* Hentz; Oxyopidae) was found feeding on an adult on *Lachnanthes*.

Pyrgus oileus oileus (Linnaeus)

STATUS: Uncommon in scrubby flatwoods and disturbed sites. One was taken in a Malaise trap in Sand Pine scrub by M. Deyrup (ABS reference collection). The dry season phenotype, *montivagus*, begins to appear in November.

Thorybes pylades (Scudder)

STATUS: Occasional in sandhill and scrubby flatwoods habitats. Frost (1975) took one in an ultraviolet light trap.

HOST PLANTS: Larvae were found on *Galactia regularis* and *Rhyncosia difformis* (Ell.) DC. (Fabaceae).

FLOWERS VISITED: *Asclepias curtissii*, *Bidens alba*, *Lantana camara*, *Lachnanthes carolinianum*.

PREDATOR: A *Phymata guerini* Lethierry & Severin (Hemiptera: Phymatidae) caught an adult at flowers (ABS reference collection).

Urbanus dorantes dorantes (Stoll)

STATUS: The Dorantes Skipper became established in Florida sometime in the late 1960's (Clench 1970). Knudson (1974) found this species to be abundant on 12 October 1972 near Bartow in Polk County. The Dorantes Skipper was abundant in the old citrus grove on Red Hill and occasional in scrubby flatwoods during the summer of 1986.

HOST PLANTS: Observed ovipositing on *Desmodium incanum* DC. (Fabaceae).

FLOWERS VISITED: *Bidens alba, Lachnanthes carolinianum, Lantana camara, Richardia scabra* L. (Rubiaceae), *Satureja rigida* Bartr. ex Benth. (Lamiaceae).

Urbanus proteus proteus (Linnaeus)

STATUS: Abundant during the fall when dispersing adults fly southward through Florida in large numbers. Frost (1969) captured a few in an ultraviolet light trap.

HOST PLANTS: Larvae were found on *Centrosema floridanum* (Britt.) Lakela, *Desmodium incanum, Desmodium tortuosum* (Sw.) DC., and *Vigna luteola* (Jacq.) Benth. (all Fabaceae).

FLOWERS VISITED: *Bidens alba, Crotalaria mucronata* Desv. (Fabaceae), *Lachnanthes carolinianum, Lantana camara, Liatris tenuifolia, Satureja rigida, Urena lobata* L. (Malvaceae).

HESPERIIDAE: HESPERIINAE

Ancyloxypha numitor (Fabricius)

STATUS: Uncommon and local in the ditches bordering the railroad tracks. Although numerous seasonal ponds occur within the flatwoods at ABS, *A. numitor* does not utilize these areas, perhaps due to the lack of suitable larval food plants. The Least Skipper is often closely associated with *Leersia* spp. (Poaceae) and other semi-aquatic grasses in Florida.

Asbolis capucinus (Lucas)

STATUS: Uncommon on the top of Red Hill and on the main grounds.

HOST PLANTS: One larva was found on *Sabal etonia* Swingle ex Nash (Arecaceae).

FLOWERS VISITED: *Ipomoea cairica* (L.) Sweet (Convolvulaceae).

Atalopedes campestris huron (Edwards)

STATUS: Occasional in scrubby flatwoods and disturbed sites. Frost (1975) took a few in an ultraviolet light trap.

FLOWERS VISITED: *Dalea feayi, Lachnanthes carolinianum, Lantana camara.*

Atrytone delaware delaware (Edwards)

STATUS: Occasional in scrubby flatwoods.

HOST PLANTS: Larvae were found on *Panicum hemitomon* Schult. (Poaceae).

FLOWERS VISITED: *Dalea feayi, Ipomoea cairica, Lachnanthes carolinianum, Lantana camara, Liatris ohlingerae* (Blake) Robins. (Asteraceae), *Liatris tenuifolia.*

Atrytonopsis hianna loammi (Whitney)

STATUS: R. W. Pease Jr. collected three adults at ABS on 16, 24, and 27 September 1960 (ABS reference collection). This species should occur in the scrubby flatwoods areas of the station, but I did not find it.

Copaeodes minimus (Edwards)

STATUS: Occasional in the old citrus grove on Red Hill and in scrubby flatwoods.
FLOWERS VISITED: *Dalea feayi, Heterotheca subaxillaris, Lachnanthes caroliniana.*

Euphyes arpa (Boisduval & Leconte)

STATUS: Abundant in scrubby flatwoods during the late summer and fall.
HOST PLANTS: Larvae were found on *Sabal etonia* and *Serenoa repens* (Bartr.) Small (Arecaceae).
FLOWERS VISITED: *Asclepias* species, *Lachnanthes carolinianum, Liatris tenuifolia, Palafoxia feayi.*
PREDATOR: An unidentified crab spider (Thomisidae) was found feeding on an adult on *Liatris.*

Hesperia meskei straton (Edwards)

STATUS: R. W. Pease Jr. collected one on 10 October 1960 at ABS (reference collection). I did not find *H. meskei* in the fall of 1986, but it should occur in the sandhill and scrubby flatwood areas of the station.

Hylephila phyleus phyleus (Drury)

STATUS: Abundant in sandhill, scrubby flatwoods, and disturbed areas. Frost (1975) took one in an ultraviolet light trap.
HOST PLANTS: Observed ovipositing on *Stenotaphrum secundatum* (Walt.) Kuntze (Poaceae).
FLOWERS VISITED: *Asclepias curtissii, Dalea feayi, Lachnanthes carolinianum, Lantana camara, Liatris tenuifolia, Satureja rigida.*
PREDATORS: Green lynx spider (*Peucetia viridans*), an unidentified crab spider (Thomisidae), *Phymata guerini* (Hemiptera: Phymatidae), all on *Lachnanthes,* and a large gray robber fly (Diptera: Asilidae).

Lerema accius accius (J. E. Smith)

STATUS: Uncommon in the old citrus grove on Red Hill and on the main grounds. Frost (1975) took a few in an ultraviolet light trap.
FLOWERS VISITED: *Bidens alba, Ipomoea cairica, Lantana camara.*

Lerodea eufala eufala (Edwards)

STATUS: Occasional in scrubby flatwoods.
FLOWERS VISITED: *Lachnanthes caroliniana, Richardia scabra.*

Nastra lherminier (Latreille)

STATUS: Uncommon in scrubby flatwoods. One was collected in a Malaise trap in Sand Pine scrub by M. Deyrup (ABS reference collection).

Oligoria maculata (Edwards)

STATUS: Occasional in scrubby flatwoods and disturbed sites.
FLOWERS VISITED: *Cirsium nuttallii* DC. (Asteraceae), *Ipomoea cairica, Lachnanthes caroliniana, Lantana camara, Liatris tenuifolia, Urena lobata.*

Panoquina ocola ocola (Edwards)

STATUS: Abundant during the fall when dispersing adults fly southward through Florida in large numbers. Frost (1966) took a few in an ultraviolet light trap.

HOST PLANTS: Observed ovipositing on *Panicum repens* L. (Poaceae).

FLOWERS VISITED: *Asclepias curtissii, Bidens alba, Balduina angustifolia, Dalea feayi, Heterotheca subaxillaris, Lachnanthes caroliniana, Lantana camara, Liatris tenuifolia, Palafoxia feayi, Wedelia trilobata.*

Polites themistocles (Latreille)

STATUS: Occasional in scrubby flatwoods. Frost (1975) took one in an ultraviolet light trap.

HOST PLANTS: Observed ovipositing on *Panicum aciculare* Desv. ex Poir. (Poaceae).

FLOWERS VISITED: *Lachnanthes carolinianum.*

Polites vibex vibex (Geyer)

STATUS: Abundant in sandhill, scrubby flatwoods, and disturbed areas. Frost (1969) captured one in an ultraviolet light trap.

FLOWERS VISITED: *Asclepias curtissii, Bidens alba, Dalea feayi, Diodia teres, Lachnanthes carolinianum, Lantana camara, Liatris tenuifolia, Momordica charantia* L. (Cucurbitaceae), *Satureja rigida, Vernonia gigantea.*

Wallengrenia otho (J. E. Smith)

STATUS: Occasional in scrubby flatwoods and disturbed sites.

FLOWERS VISITED: *Asclepias curtissii, Lachnanthes carolinianum, Lantana camara.*

HESPERIIDAE: MEGATHYMINAE

Megathymus yuccae buchholzi H. A. Freeman

STATUS: Although adults were seen infrequently, immatures were abundant on Red Hill and in scrubby flatwoods during 1986 and 1987. Males perched on the ground or low vegetation in open areas at mid-day. Late-instar larvae began to develop wax glands and finished feeding in October and November.

HOST PLANTS: Ova and larvae were found on *Yucca aloifolia* L. and *Yucca filamentosa* L. (Agavaceae).

PAPILIONIDAE: PAPILIONINAE

Battus philenor philenor (Linnaeus)

STATUS: Uncommon in sandhill and scrubby flatwoods habitats.

HOST PLANTS: No native *Aristolochia* species (Aristolochiaceae) have been found at ABS (Vander Kloet 1986), and the Pipevine Swallowtail does not seem to utilize the exotic *Aristolochia littoralis* Parodi naturalized on the main grounds of the station. The few adults taken may represent strays from the Highlands Hammock area, where breeding populations are present.

Battus polydamas lucayus (Rothschild & Jordan)

STATUS: Often abundant during the fall, but local near patches of the larval food plant on the main grounds.

HOST PLANTS: Larvae were abundant on *Aristolochia littoralis* during the fall.

FLOWERS VISITED: *Clerodendrum speciosissimum* Van Geert (Verbenaceae), *Salvia coccinea* Buchoz. ex Etling (Lamiaceae).

Eurytides marcellus floridensis (Holland)

STATUS: Abundant in Sand Pine scrub, sandhill, and scrubby flatwoods habitats.
HOST PLANTS: One larva was found on *Asimina obovata* (Willd.) Nash (Annonaceae).
FLOWERS VISITED: *Lachnanthes carolinianum.*

Papilio cresphontes Cramer

STATUS: Often abundant but local near citrus on Red Hill and the main grounds.
HOST PLANTS: Observed ovipositing on *Citrus* sp. (Rutaceae).
FLOWERS VISITED: *Cirsium nuttallii, Clerodendrum speciosissimum, Lantana camara, Palafoxia feayi, Salvia coccinea, Urena lobata.*

Papilio glaucus australis Maynard

STATUS: Occasional on Red Hill and the main grounds.
FLOWERS VISITED: *Cirsium nuttallii, Lantana camara, Urena lobata.*

Papilio palamedes Drury

STATUS: Abundant in scrubby flatwoods and other habitats.
FLOWERS VISITED: *Befaria racemosa* Vent. (Ericaceae), *Cirsium nuttallii, Clerodendrum speciosissimum, Lachnanthes carolinianum, Lantana camara, Salvia coccinea.*

Papilio polyxenes asterius Stoll

STATUS: Uncommon in scrubby flatwoods and disturbed sites.
HOST PLANTS: Observed ovipositing on *Ptilimnium capillaceum* (Michx.) Raf. (Apiaceae). Larvae and pupae were found on *Eryngium cuneifolium* Small (Apiaceae).
FLOWERS VISITED: *Lachnanthes carolinianum.*

Papilio troilus ilioneus J. E. Smith

STATUS: Abundant in scrubby flatwoods and on the main grounds.
HOST PLANTS: Larvae were found on *Persea borbonia* (L.) Spreng. (Lauraceae).
FLOWERS VISITED: *Clerodendrum speciosissimum, Lachnanthes carolinianum, Lantana camara.*

PIERIDAE: PIERINAE

Ascia monuste phileta (Fabricius)

STATUS: Abundant during early summer in the old citrus grove on Red Hill. Occasional in other habitats.
FLOWERS VISITED: *Polygala rugelii* Shuttlew. (Polygalaceae).

Pontia protodice (Boisduval & Leconte)

STATUS: Abundant in the citrus grove on Red Hill during early summer. Occasional in other habitats.
HOST PLANTS: Observed ovipositing on *Lepidium virginicum* L. (Brassicaceae).
FLOWERS VISITED: *Salvia coccinea.*

PIERIDAE: COLIADINAE

Colias eurytheme Boisduval

STATUS: Uncommon in scrubby flatwoods.
FLOWERS VISITED: *Lachnanthes carolinianum, Liatris tenuifolia.*

Eurema daira daira (Godart)

STATUS: Abundant during the fall when dispersing adults fly southward through Florida in large numbers.
HOST PLANTS: Observed ovipositing on *Aeschynomene americana* L. (Fabaceae) and *Indigofera hirsuta* Harv. (Fabaceae) just south of ABS at Venus.
FLOWERS VISITED: *Bidens alba, Dalea feayi, Elephantopus elatus* Bertol. (Asteraceae), *Eryngium cuneifolium, Galactia regularis, Heterotheca subaxillaris, Lachnanthes carolinianum, Liatris tenuifolia, Lippia nodiflora* (L.) Michx. (Verbenaceae), *Momordica charantia, Palafoxia feayi, Pityopsis graminifolia* (Michx.) Nutt. (Asteraceae), *Polygonella robusta* (Small) Horton (Polygonaceae), *Richardia scabra, Wedelia trilobata.* Adults also sip water from wet soil occasionally.

Eurema lisa lisa Boisduval and Leconte

STATUS: Abundant but often rather local near the larval food plant in Sand Pine scrub, sandhill, and scrubby flatwoods habitats. The winter form, which has reduced black borders on the upperside of the hindwings, begins to appear in November.
HOST PLANTS: Observed ovipositing on *Cassia fasciculata* (Michx.) Greene (Fabaceae).
FLOWERS VISITED: *Dalea feayi, Galactia regularis, Richardia scabra, Satureja rigida.*

Eurema nicippe (Cramer)

STATUS: Abundant in the vicinity of the larval host plant along a firelane at Hicoria. Occasional in other habitats.
HOST PLANTS: Larvae were found on *Cassia occidentalis* L. (Fabaceae).

Nathalis iole Boisduval

STATUS: Apparently abundant in disturbed sites some years. Rutowski (1981) studied the mating behavior of *N. iole* at ABS from July to November 1981. He commented that this species "flies all year" at the station. I did not find the Dainty Sulfur during any of my surveys at ABS.

Phoebis agarithe maxima (Neumoegen)

STATUS: An uncommon vagrant from south Florida. One specimen in the reference collection was taken on 28 July 1967 at ABS.

Phoebis philea philea (Johansson)

STATUS: On 5 August 1966, T. E. Pliske captured a female of this species at ABS (reference collection). *Phoebis philea* breeds in residential areas of Highlands County where ornamental species of *Cassia* have been planted (H. D. Baggett pers. comm.).

Phoebis sennae eubule (Linnaeus)

STATUS: Abundant during the fall when dispersing adults fly southward through Florida in large numbers. Of 10 individuals observed on 8 February 1987, all were flying north.

HOST PLANTS: Observed ovipositing on *Cassia fasciculata*. Larvae were found on *Cassia occidentalis*.

FLOWERS VISITED: *Bidens alba, Clerodendrum speciosissimum, Lachnanthes carolinianum, Lantana camara, Liatris ohlingerae, Liatris tenuifolia, Richardia scabra, Salvia coccinea.*

Zerene cesonia (Stoll)

STATUS: Uncommon in scrubby flatwoods.

FLOWERS VISITED: *Asclepias tuberosa* ssp. *rolfsii* (Britt.) Woods. (Asclepiadaceae), *Lachnanthes caroliniana.*

LYCAENIDAE: EUMAEINAE

Atlides halesus halesus (Cramer)

STATUS: Uncommon in sandhill habitats. Frost (1969) captured one in an ultraviolet light trap.

HOST PLANTS: Hatched egg shells, probably of this species, were found on *Phoradendron serotinum* (Raf.) M. C. Johnst. (Loranthaceae) growing on *Quercus myrtifolia* and *Quercus geminata* Willd. (Fagaceae).

Calycopis cecrops (Fabricius)

STATUS: Abundant in Sand Pine scrub, sandhill, scrubby flatwoods and on the main grounds. Frost (1969) took one in an ultraviolet light trap. Males hilltop in trees of various sizes. Dozens were frequently seen perching and chasing each other in the large laurel oaks planted on the main grounds during July and August. I have also observed males hilltopping on scrub oaks less than three meters tall. Hilltopping adults were especially active late in the afternoon and also on cloudy days.

HOST PLANTS: Associated with oaks (*Quercus myrtifolia, Quercus chapmannii* Sarg., and *Quercus hemisphaerica*) and mango (*Mangifera indica* L., Anacardiaceae). Larvae from a single female grew most rapidly on shoots and young leaves of mango, and more slowly on those of *Rhus copallina* L. (Anacardiaceae), *Q. hemisphaerica*, and *Toxicodendron radicans* (L.) Kuntze (Anacardiaceae).

FLOWERS VISITED: *Asclepias curtissii, Bidens alba, Dalea feayi, Gelsemium sempervirens* (L.) J. St. Hil. (Loganiaceae), *Lachnanthes carolinianum, Lantana camara, Solidago sp.* (Asteraceae).

Euristrymon favonius (J. E. Smith)

STATUS: Abundant in late spring and early summer in Sand Pine scrub, scrubby flatwoods, and on the main grounds. Frost (1975) took one in an ultraviolet light trap. Adults are associated with oaks.

FLOWERS VISITED: *Asclepias curtissii, Persea humilis* Nash (Lauraceae).

Parrhasius m-album (Boisduval & Leconte)

STATUS: Uncommon in scrubby flatwoods and on the main grounds. Frost (1975) captured a few in an ultraviolet light trap. Adults are associated with oaks.

FLOWERS VISITED: *Bidens alba, Lachnanthes carolinianum, Sabal etonia.*

Satyrium calanus calanus (Hübner)

STATUS: Two individuals were collected by R. W. Pease Jr. on 10 May 1958 (ABS reference collection). ABS is the southernmost locality where this species has been recorded

in Florida. Some populations of *S. calanus* in Florida are associated with oaks, whereas others occur on hickory. Oaks as well as Scrub Hickory (*Carya floridana* Sarg., Juglandaceae) are abundant at the station.

Strymon melinus melinus Hübner

STATUS: Abundant in Sand Pine scrub, sandhill, scrubby flatwoods, and disturbed sites.

HOST PLANTS: Observed ovipositing on *Desmodium incanum* flowers, and often associated with *Galactia* species.

FLOWERS VISITED: *Asclepias curtissii, Bidens alba, Dalea feayi, Diodia teres, Eriogonum floridanum* Small (Polygonaceae), *Eryngium cuneifolium, Galactia regularis, Lachnanthes carolinianum, Liatris tenuifolia, Licania michauxii* Prance (Chrysobalanaceae), *Palafoxia feayi, Sabal etonia.*

LYCAENIDAE: POLYOMMATINAE

Hemiargus ceraunus antibubastus Hübner

STATUS: Abundant in Sand Pine scrub and sandhill habitats.

HOST PLANTS: Observed ovipositing on *Cassia fasciculatis, Indigofera hirsuta,* and *Galactia regularis* flowers. Larvae were found on *Chapmannia floridana* Torr. & Gray (Fabaceae) and *Indigofera carolinanum* flowers.

FLOWERS VISITED: *Asclepias curtissii, Balduina angustifolia, Dalea feayi, Diodia teres, Eriogonum floridanum, Eryngium cuneifolium, Lachnanthes carolinianum, Liatris tenuifolia, Licania michauxii, Satureja rigida.*

PARASITOID: *Rogas* species (Braconidae) reared from a larva on *Chapmannia,* 1 October 1986, T. Eisner (ABS reference collection).

Leptotes cassius theonus (Lucas)

STATUS: This species appears to colonize the station during favorable years. The reference collection has specimens from 1957 and 1960. I have not found the Cassius Blue at ABS, but several were seen in nearby Lake Placid during November 1987 in association with an exotic mimosoid tree. Frost (1964) supposedly collected a *Hemiargus thomasi bethunebakeri* Comstock & Huntington in a light trap at ABS; however, this species has been recorded only in the Florida Keys and southernmost mainland. Dr. Frank Fee kindly checked the Frost collection at Pennsylvania State University, examined the specimen, and determined that it is a female *L. cassius,* not *H. thomasi.*

NYMPHALIDAE: HELICONIINAE

Agraulis vanillae nigrior Michener

STATUS: Occasional in scrubby flatwoods and disturbed sites, especially during the fall when dispersing adults fly southward through Florida in large numbers.

FLOWERS VISITED: *Bidens alba, Lachnanthes carolininanum, Liatris tenuifolia, Richardia scabra.*

Heliconius charitonius tuckeri Comstock & Brown

STATUS: Abundant during the fall in shady areas on the main grounds.

HOST PLANTS: Larvae were found on an exotic species of *Passiflora* (Passifloraceae) growing in the old citrus grove on Red Hill.

NYMPHALIDAE: NYMPHALINAE

Anartia jatrophae guantanamo Munroe

STATUS: Occasional to abundant during the fall, when adults of this tropical species disperse northward.
FLOWERS VISITED: *Lachnanthes caroliniana, Lippia nodiflora, Vernonia gigantea.*

Basilarchia archippus floridensis (Strecker)

STATUS: Uncommon and local around patches of willow near Lake Annie; observed once on the main grounds.
HOST PLANT: Larvae were found on *Salix caroliniana* Michx. (Salicacaeae).

Euptoieta claudia (Cramer)

STATUS: I observed one adult at Hicoria on 27 November 1983. The Variegated Fritillary probably colonizes ABS in some years.

Junonia coenia (Hübner)

STATUS: Abundant in scrubby flatwoods and other habitats.
HOST PLANTS: Larvae were found on *Seymeria pectinata* Pursh (Scrophulariaceae).
FLOWERS VISITED: *Dalea feayi, Lachnanthes carolinianum, Liatris tenuifolia, Lyonia ferruginea* (Walt.) Nutt. (Ericaceae), *Satureja rigida.*

Marpesia petreus (Cramer)

STATUS: The Ruddy Dagger Wing rarely strays into Highlands County from tropical South Florida. Comstock and Comstock (1902) collected one in May at Avon Park. Frost took one at ABS on 16 December 1959 (Kimball 1965).

Phyciodes phaon (Edwards)

STATUS: Uncommon along roadsides and on Red Hill.
FLOWERS VISITED: *Bidens alba.*

Phyciodes tharos tharos (Drury)

STATUS: R. W. Pease Jr. took one on 19 December 1957 (ABS reference collection). I have not found the Pearl Cresent at ABS, although the larval food plants, *Aster* spp. (Asteraceae), are present. This butterfly is abundant and widespread throughout Florida. Its scarcity at ABS is a mystery.

Polygonia interrogationis (Fabricius)

STATUS: One specimen (form *fabricii*) was taken at ABS on 5 December 1965 (ABS reference collection). The Question Mark is abundant 40 km north of the station at Highlands Hammock State Park (H. D. Baggett pers. comm.).

Vanessa atalanta rubria (Fruhstorfer)

STATUS: Uncommon in the citrus grove on Red Hill and on the main grounds. Frost (1966) took one in an ultraviolet light trap.
HOST PLANTS: Larvae were found on *Boehmeria cylindrica* (L.) Sw. (Urticaceae).
FLOWERS VISITED: *Polygonella robusta.*

Vanessa virginiensis (Drury)

STATUS: Uncommon in the old citrus grove on Red Hill and in scrubby flatwoods.
FLOWERS VISITED: *Lachnanthes carolinianum* and *Lantana camara.*

NYMPHALIDAE: SATYRINAE

Hermeuptychia sosybius (Fabricius)

STATUS: Abundant in shady areas on the main grounds. Frost (1964) captured one in an ultraviolet light trap.
FLOWERS VISITED: *Bidens alba.*

Neonympha areolata areolata (J. E. Smith)

STATUS: Comstock and Comstock (1902) reported the Georgia Satyr to be "very common over marshes in April and May, both at Avon Park and Lake Josephine." At ABS, R. W. Pease Jr. collected a few in August and October 1960 (reference collection) and Oosting and Harvey (1976) recorded it in April 1975. I did not find *N. areolata* on my surveys of the station.

NYMPHALIDAE: DANAINAE

Danaus gilippus berenice (Cramer)

STATUS: Occasional in scrubby flatwoods and sandhill habitats. Brower's (1961, 1962) data suggest that *D. gilippus berenice* is more abundant than *D. plexippus* in Highlands County, especially during the summer.
HOST PLANTS: M. F. Minno found larvae on *Asclepias curtissii, Asclepias tomentosa* Ell. (Asclepiadaceae), and *Asclepias tuberosa* ssp. *rolfsii.* Brower (1961) also reports immatures on *Asclepias humistrata* Walt. and *Asclepias curassavica* L. (Asclepiadaceae) in Highlands County.
FLOWERS VISITED: *Bidens alba, Balduina angustifolia, Dalea feayi, Heterotheca subaxillaris, Lachnanthes caroliniana, Lantana camara, Liatris tenuifolia.*

Danaus plexippus plexippus (Linnaeus)

STATUS: Most abundant during spring and fall in disturbed scrub habitats, but also present and breeding in small numbers during the summer.
HOST PLANTS: Brower (1961) reports Monarch immatures on *Asclepias humistrata, Asclepias tuberosa* ssp. *rolfsii,* and *Asclepias curassavica* in Highlands County.
FLOWERS VISITED: *Bidens alba, Polygonella robusta.*

Faunal Composition

Seventy species of butterflies have been found at ABS. Eleven additional species have been recorded from Highlands County, but not Archbold (Table 1). The least-probable of these to be found at the station is *I. henrici margaretae* dos Passos, which seems to be a poor disperser and usually occurs in swamps with an abundance of *Ilex cassine* L. (Aquifoliaceae), a larval food plant. *Calephelis virginiensis* (Guérin-Méneville) is likely to be an overlooked resident at ABS. This metalmark occurs in flatwoods at Sebring (35 km north of ABS on the Lake Wales Ridge) similar to those present at the station. The other

TABLE 1. Butterflies recorded from Highlands County, Florida, but not the Archbold Biological Station.

Family	Species
Hesperiidae	*Calpodes ethlius* (Stoll)
	Euphyes pilatka pilatka (Edwards)
	Poanes aaroni howardi (Skinner)
	Problema byssus (Edwards)
Pieridae	*Pieris rapae* (Linnaeus)
Lycaenidae	*Incisalia henrici margaretae* dos Passos
Riodinidae	*Calephelis virginiensis* (Guérin-Méneville)
Nymphalidae	*Asterocampa celtis reinthali* Friedlander
	Asterocampa clyton flora (Edwards)
	Danaus eresimus tethys Forbes
	Megisto cymela viola (Maynard)

butterflies may eventually be recorded from ABS as stray individuals or temporary colonizers.

The butterfly fauna of the station is an ever-changing mixture of species. In any particular year, additional species may become established and others may disappear. Many butterflies are highly vagile and disperse great distances, which may account for the several species recorded from ABS as single individuals. Some species are dependent upon ephemeral weedy habitats or specific stages in fire-maintained communities, and must frequently colonize new areas. Changes in habitat and climate are likely to cause changes in the butterfly fauna. Highlands County is a rapidly changing area, and many natural areas are being converted to pastures, orange groves, and urban environments

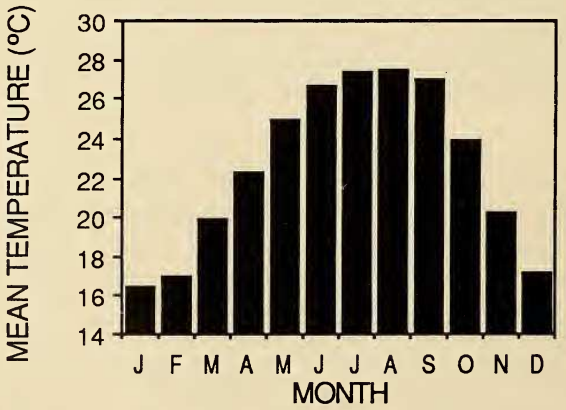

FIG. 3. Long-term mean monthly temperature at the Archbold Biological Station, Highlands County, Florida (National Oceanic & Atmospheric Administration 1987).

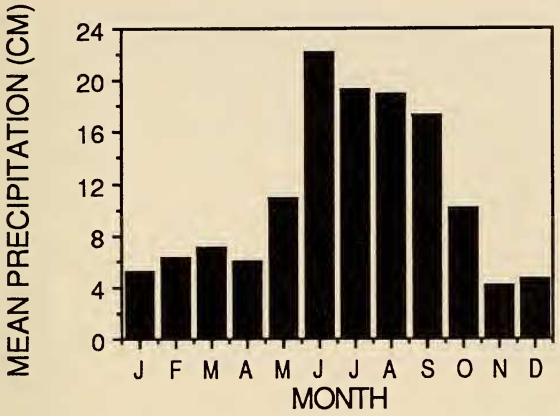

FIG. 4. Long-term mean monthly precipitation at the Archbold Biological Station, Highlands County, Florida (National Oceanic & Atmospheric Administration 1987).

(Peroni & Abrahamson 1985). ABS is changing in a different way. Large portions of the sandhill areas have not been burned for some time, and although small fires occur regularly in the flatwoods, large fires do not. Many areas of the station today look quite different from photographs taken in the 1930's (ABS archives).

A number of tropical species, including *Urbanus dorantes*, *Pyrgus oileus*, *Battus polydamas*, *Ascia monuste*, *Nathalis iole*, *Phoebis philea*, *Phoebis agarithe*, *Leptotes cassius*, *Heliconius charitonius*, and *Anartia jatrophae*, have a tendency to disperse northward, especially in the fall. These species occur sporadically at ABS. Some are known from single

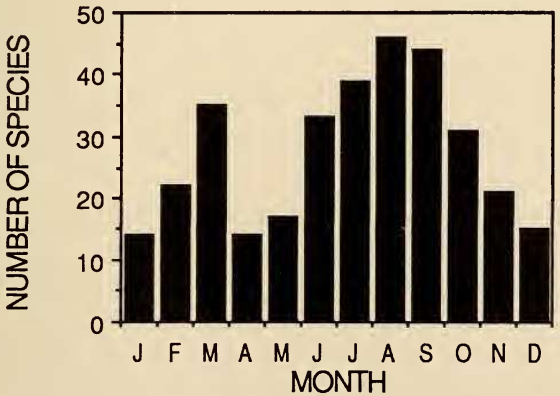

FIG. 5. The number of butterfly species recorded each month at the Archbold Biological Station, Highlands County, Florida.

TABLE 2. Records of monthly occurrence (indicated by an "×") of adult butterflies at the Archbold Biological Station, Highlands County, Florida.

Species	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Hesperiidae: Pyrginae												
Epargyreus c. clarus	—	—	×	—	—	—	×	×	—	—	—	—
Erynnis brizo somnus	×	×	×	×	—	—	—	—	—	—	—	—
Erynnis horatius	×	×	×	×	×	×	×	×	×	—	—	—
Erynnis j. juvenalis	×	×	×	—	—	—	×	—	—	—	—	—
Erynnis z. zarucco	—	×	×	—	×	×	×	×	×	×	—	—
Pyrgus o. oileus	—	—	—	—	—	—	×	×	×	×	×	×
Thorybes pylades	—	—	×	—	—	—	×	×	×	—	—	—
Urbanus d. dorantes	—	×	—	—	—	—	×	×	×	—	×	—
Urbanus p. proteus	×	—	×	—	×	—	×	×	×	×	×	×
Hesperiidae: Hesperiinae												
Ancyloxypha numitor	—	—	—	—	—	—	—	×	—	—	×	×
Asbolis capucinus	—	—	—	—	—	—	—	—	×	—	×	—
Atalopedes campestris huron	×	×	×	—	—	×	×	×	×	—	—	—
Atrytone d. delaware	—	—	×	—	—	×	×	×	—	—	—	—
Atrytonopsis hianna loammi	—	—	—	—	—	—	—	—	×	—	—	—
Copaeodes minimus	—	—	—	—	—	×	×	×	×	—	—	—
Euphyes arpa	—	—	—	—	—	—	×	×	×	×	—	—
Hesperia meskei straton	—	—	—	—	—	—	—	—	—	×	—	—
Hylephila p. phyleus	—	×	×	—	—	—	×	×	×	—	—	—
Lerema a. accius	×	×	—	—	—	—	—	—	×	—	×	×
Lerodea eufala	—	—	—	—	—	—	—	×	×	×	—	—
Nastra lherminier	—	—	—	—	—	—	×	×	×	×	—	—
Oligoria maculata	—	—	×	—	—	×	×	—	×	×	—	—
Panoquina o. ocola	×	—	—	—	—	—	×	×	×	×	×	—
Polites themistocles	—	—	×	—	—	×	—	×	×	—	—	—
Polites v. vibex	—	×	×	×	—	×	×	×	×	—	×	—
Wallengrenia otho	—	—	—	—	—	×	×	×	×	×	—	—
Hesperiidae: Megathyminae												
Megathymus yuccae buchholzi	—	×	×	×	—	—	—	—	—	—	—	—
Papilionidae: Papilioninae												
Battus p. philenor	—	—	×	—	—	—	×	×	—	—	—	—
Battus polydamas lucayus	×	×	—	×	×	×	—	×	×	×	×	—
Eurytides m. floridensis	—	—	×	×	—	×	×	×	×	×	—	—
Papilio cresphontes	—	×	×	×	—	×	×	—	×	×	×	—
Papilio glaucus australis	—	—	×	×	×	×	×	×	×	×	—	—
Papilio palamedes	—	×	×	×	—	×	×	×	×	×	×	—
Papilio polyxenes asterius	—	—	×	×	×	×	—	—	×	×	—	—
Papilio troilus ilioneus	—	—	×	×	×	×	×	×	×	—	—	—
Pieridae: Pierinae												
Ascia monuste phileta	—	—	—	—	—	×	×	×	—	×	—	—
Pontia protodice	—	—	—	—	×	×	×	—	—	—	—	—
Pieridae: Coliadinae												
Colias eurytheme	—	—	—	—	×	×	—	×	×	—	—	—
Eurema daira daira	×	×	×	—	—	×	×	×	×	×	×	×
Eurema l. lisa	—	×	×	—	—	×	×	×	×	—	×	×
Eurema nicippe	×	—	—	—	—	—	—	×	×	—	×	—

TABLE 2. Continued.

Species	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Nathalis iole	—	×	×	—	—	—	×	—	—	—	—	×
Phoebis agarithe maxima	—	—	—	—	—	—	×	—	—	—	—	—
Phoebis p. philea	—	—	—	—	—	—	—	×	—	—	—	—
Phoebis sennae eubule	×	×	×	—	—	×	×	×	×	×	×	—
Zerene cesonia	—	—	×	—	×	—	—	×	—	×	—	—
Lycaenidae: Eumaeinae												
Atlides h. halesus	—	×	×	—	×	—	—	—	—	—	—	—
Calycopis cecrops	—	×	—	—	×	×	×	×	×	×	×	—
Euristrymon favonius	—	—	—	×	×	×	—	—	—	—	—	—
Parrhasius m-album	—	×	—	×	—	×	×	×	—	×	—	—
Satyrium c. calanus	—	—	—	—	×	—	—	—	—	—	—	—
Strymon m. melinus	—	—	×	—	×	×	×	×	×	×	×	—
Lycaenidae: Polyommatinae												
Hemiargus c. antibubastus	—	—	×	—	—	×	—	×	×	×	×	×
Leptotes cassius theonus	—	—	—	—	—	—	—	×	—	×	—	×
Nymphalidae: Heliconiinae												
Agraulis vanillae nigrior	—	—	×	—	—	—	—	×	×	×	×	—
Heliconius charitonius tuckeri	—	—	—	—	—	×	—	×	×	×	×	—
Nymphalidae: Nymphalinae												
Anartia jatrophae guantanamo	—	—	—	—	—	—	—	×	×	×	—	—
Basilarchia a. floridensis	—	—	—	—	—	×	—	×	×	—	×	—
Euptoieta claudia	—	—	—	—	—	—	—	—	—	—	×	—
Junonia coenia	—	—	×	—	—	—	×	×	×	×	×	—
Marpesia petreus	—	—	—	—	—	—	—	—	—	—	—	×
Phyciodes phaon	—	—	×	—	—	×	—	—	×	—	—	—
Phyciodes t. tharos	—	—	—	—	—	—	—	—	—	—	—	×
Polygonia interrogationis	—	—	—	—	—	—	—	—	—	—	—	×
Vanessa atalanta rubria	×	×	—	—	—	×	×	—	—	—	—	×
Vanessa virginiensis	—	—	×	—	—	—	×	—	—	—	—	—
Nymphalidae: Satyrinae												
Hermeuptychia sosybius	×	×	×	—	×	×	—	—	×	×	×	×
Neonympha a. areolata	—	—	—	×	—	—	—	×	—	×	—	—
Nymphalidae: Danainae												
Danaus gilippus berenice	—	—	×	—	×	×	×	×	×	—	×	×
Danaus p. plexippus	—	—	×	×	×	×	×	×	—	×	—	×

individuals; others establish ephemeral populations during favorable years. A few butterflies migrate southward through Florida in great numbers during the fall (Walker 1978, 1985). Southward-bound migrants such as *Urbanus proteus, Panoquina ocola, Eurema daira, Phoebis sennae, Agraulis vanillae,* and *Junonia coenia* occur in greatest abundance at ABS during late August, September, and October.

There are no butterflies endemic to the scrubs of the Lake Wales Ridge (Deyrup 1989), but several are found primarily in peninsular

Florida. Peninsular Florida endemics that occur in Highlands County include *Erynnis brizo somnus*, *Euphyes arpa*, *Papilio glaucus australis*, *Papilio troilus ilioneus*, *Eurytides marcellus floridensis*, *Satyrium calanus calanus*, *Incisalia henricii margaretae*, *Euristrymon favonius*, *Basilarchia archippus floridensis*, *Asterocampa celtis reinthali*, and *Asterocampa clyton flora*. None of these butterflies are rare or endangered.

Phenology

Figures 3 and 4 show climatological data for ABS. The wet season corresponds to summer, beginning in May and ending in October. Temperature (Fig. 3) and rainfall (Fig. 4) peak between June and September. Although adult butterflies may be found all in months at the station, there are two peaks in species richness and abundance (Fig. 5). The first peak occurs in March, when species overwintering as immatures break diapause, complete development, and emerge as adults. A second peak occurs in late summer and early fall (August/September), when most resident species reach their greatest abundance and many migrant butterflies travel through Highlands County. Table 2 presents the monthly occurrence of each species at ABS.

The majority of butterfly species at ABS are multivoltine, but some species, particularly oak-feeders, emerge as adults only in the spring or early summer. Univoltine species include *Erynnis brizo*, *Erynnis juvenalis*, *Megathymus yuccae*, *Satyrium calanus*, and *Euristrymon favonius*. Spring adults of multiple-brooded species often are smaller or patterned somewhat differently from later generations. This is especially true of those that overwinter in the pupal stage, such as swallowtails (Papilionidae). A few butterflies found at ABS overwinter in the adult stage. Adult diapausing species often have different summer and winter phenotypes, as in *Pyrgus oileus*, *Eurema* spp., *Zerene cesonia*, *Junonia coenia*, *Phyciodes phaon*, and *Phyciodes tharos*. The winter forms of most of these species are brownish or reddish on the undersides of the hindwings, instead of the paler colors of summer individuals.

Adult and Larval Resources

At least 70 of the approximately 620 species of vascular plants that grow at ABS are used by butterflies as larval hosts or as sources of nectar for adults. Only about 13% of the flora consists of monocots; yet the larvae of nearly 30% of the butterfly species feed on plants in this group, such as grasses, sedges, palms, and yuccas. Among the dicots, the Asteraceae, Fabaceae, Fagaceae, Lamiaceae, Rubiaceae, and Verbenaceae are the more important families used by butterflies.

A few rare plants such as *Asclepias curtissii*, *Conradina canescens*, *Eryngium cuneifolium*, and *Liatris ohlingerae* are used occasionally by butterflies at ABS. On the other hand, exotics like *Aristolochia literalis*, *Citrus* spp., *Clerodendrum speciosissium*, and *Wedelia trilobata* are used as well. The flowers of weedy plants such as *Bidens alba* and *Lantana camara* may be visited by multitudes of butterflies during late summer and fall, but are often ignored at other seasons. Native plants with flowers attractive to many butterflies include palmettos, *Asclepias* spp., *Lachnanthes carolinianum*, *Dalea feayi*, *Balduina angustifolia*, *Liatris* spp., and *Satureja rigida*.

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